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## **Comment on nhess-2022-12**

Matthias Klawa (Referee)

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Referee comment on "Using high-resolution global climate models from the PRIMAVERA project to create a European winter windstorm event set" by Julia F. Lockwood et al., Nat. Hazards Earth Syst. Sci. Discuss., <https://doi.org/10.5194/nhess-2022-12-RC1>, 2022

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### **General comments**

In my opinion this paper gives a good overview of the analysis of the current European windstorm risk based on high resolution global climate model data sets. Especially for insurance and reinsurance companies the resulting PRIMAVERA windstorm event set could get a reference for risk management processes: Due to requirement by the EIOPA (European Insurance and Occupational Pensions Authority) insurance and reinsurance companies have to discuss the impact of climate change scenarios on their business. As the climate change predictions of the EUROPEAN windstorm risk are still quite vague in many regions as even the sign of change is still not robust further research are needed. The presented paper and the mentioned further work on coupled PRIMAVERA climate projection could reduce this uncertainty.

From a scientific point of view the results and applied techniques of the work are probably not completely new ground, but I like the 'engineering' approach to build up the model event set. The presented results on storm clustering, the estimated return periods of the extreme windstorm season 1989/90 and the correlation of windstorm occurrence with NAO phases help to discuss the windstorm risk in EUROPE.

I believe this paper should be published, provided that some minor revisions are applied. I would prefer a more critical discussion of some assumptions and results.

## **Specific comments**

### **Introduction:**

I think that some hints on the requirements of the EIOPA, which wants EU based insurers to discuss their business in the context of climate change is missing. Perhaps these two links could be helpful:

Consultation on Application guidance on running climate change materiality assessment and using climate change scenarios in the ORSA | Eiopa (europa.eu), <https://www.eiopa.europa.eu/document-library/consultation/consultation-application-guidance-running-climate-change-materiality-0>

and

European Commission, Joint Research Centre, Spinoni, J., Formetta, G., Mentaschi, L., et al., Global warming and windstorm impacts in the EU : JRC PESETA IV project : Task 13, Publications Office, 2020, <https://data.europa.eu/doi/10.2760/039014>

### **Data:**

ERA5 wind gust data is set as a reference for the reality. I am missing a reality check or at least some references on the quality of the gust speed representation of the ERA5 data. Gust speeds are the main driver of the used loss function. If they are of minor quality the results will suffer from it, too.

The authors are using the output of different climate models, which probably differ in the representation of the storm tracks and other wind related issues. I would like to see some general figures on the representation of wind over Europe for each model in the appendix (e. g. storm tracks, high percentiles of wind, ...), . Perhaps some short remarks on the main differences compared to ERA5.

## Loss estimation:

The authors are using a loss index derived by Klawns and Ulrich (2003). Although this index is widely used, there could be other possible formulations for a loss function. For example: power law damage function with higher exponents than 3. For example:

Prahl, B. F., Rybski, D., Burghoff, O., and Kropp, J. P.: Comparison of storm damage functions and their performance, Nat. Hazards Earth Syst. Sci., 15, 769–788, <https://doi.org/10.5194/nhess-15-769-2015>, 2015.

Higher exponents could amplify LI differences between the used climate models and could have large impact in estimations of future losses, when wind speeds might get higher. I would not expect a detailed evaluation of possible effects, but at least a discussion.

## Results

Line 305:

*„Figure 5 shows a selection of some of the most damaging storms from the re-analysis and ones of similar strength (as measured by the LI) from the PRIMAVERA models.“*

What is „similar strength“? For example: In the case of Daria the LI is 6x or 2x larger than the PRIMAVERA model footprints. I think it could be helpful to see a selection of model footprints, which are really close to the Daria's LI. Furthermore, I would like to see footprints of events, that are close to the 200 year event. Do they look real?

